

- 220      Capt. E. W. Creak. *Magnetical Results of* [June 20,  
Helmholtz (H. von), For. Mem. R.S. *Handbuch der Physiologischen  
Optik. Zweite Auflage. Lief. 11. 8vo. Leipzig 1895.*  
The Publisher.  
Norman (J. H.) *Prices and Monetary and Currency Exchanges of  
the World. 8vo. London 1895.* The Author.  
Preston (T.) *The Theory of Light. Second edition. 8vo. London  
1895.* The Author.  
Prince (C. L.) *A Record of the Great Frost of January and  
February, 1895. Folio. Lewes 1895.* The Author.  
Reid (C.) *On Scottish Inter-Glacial Deposits. 8vo. [London]  
1895; [and 2 other Excerpts]. 8vo.* The Author.  
Rockhill (W. W.) *Diary of a Journey through Mongolia and Tibet  
in 1891 and 1892. 8vo. Washington 1894.*  
Smithsonian Institution, Washington.  
Schück (A.) *Magnetische Beobachtungen an der Deutschen Bucht  
der Nordsee. 1894. 8vo. Hamburg 1895.* The Author.

June 20, 1895.

The LORD KELVIN, D.C.L., LL.D., President, in the Chair.

Mr. J. Wolfe Barry, Professor A. G. Bourne, Professor J. R. Green, Mr. E. H. Griffiths, Mr. C. T. Heycock, Professor S. J. Hickson, Major Holden, Prof. W. MacEwen, Dr. S. Martin, Professor G. M. Minchin, and Mr. W. H. Power were admitted into the Society.

A List of the Presents received was laid on the table, and thanks ordered for them.

The following Papers were read:—

- I. "On the Magnetical Results of the Voyage of H.M.S. 'Penguin,' 1890-93." By E. W. CREAK, Captain R.N., F.R.S. Received May 8, 1895.

(Abstract.)

In view of the numerous magnetic surveys of different countries which have been made in recent years, it seems important to call attention to the increasing value of magnetic surveys made over that much larger area of the earth, the sea; the coasts washed by the sea; magnetic disturbances proceeding from land under the sea, and the settlement of the question of the direction of the iso-magnetics when passing from deep water to the land.

The magnitude of the subject is self evident, therefore it is presumed that under existing circumstances of paucity of information, any well conducted series of observations of the kind required will be welcomed.

H.M. surveying ship "Penguin" being ordered to survey the West Coast of Australia, proceeding there by way of the Suez Canal, it was decided to equip that vessel with the necessary absolute magnetic instruments for observations on land and other necessary instruments for relative observations on board the ship. The "Penguin" being practically an iron ship, general observations of the magnetic elements at sea were not undertaken, but the special attention of the observing officers was directed to obtaining the following observations:—

- (1.) The magnetic elements on land at all ports visited.
- (2.) Local magnetic disturbances on islands.
- (3.) The magnetic survey of the West Coast of Australia, which, until the "Meda's" observations in 1885-86, was a *terra incognita* as far as the inclination and force were concerned.
- (4.) The position and extent of an area of remarkable local magnetic disturbance, reported by H.M. surveying vessel "Meda" as situated under the sea at Port Walcott (N.W. Australia) and two miles from the visible land.

With regard to (1)—A series of observations with the absolute instruments were made at twenty-three different places situated on the route from Malta, *via* Australia, to Hong Kong. These are shown in Table I.

For (2)—Observations of local magnetic disturbance on land were made at Perim Island and Baudin Island (N. Australia). At Perim the principal disturbance was found in the inclination, being about  $1\frac{1}{2}^{\circ}$  to  $2^{\circ}$  in value. At Baudin Island, the declination was disturbed  $5\frac{1}{2}^{\circ}$ , the inclination  $2\frac{3}{4}^{\circ}$ . Horizontal force undisturbed.

For (3)—The magnetic elements were observed at twelve stations between King George's Sound and Baudin Island.

With regard to (4), the chief interest lies in the area of disturbance termed a "magnetic shoal," from its situation at 9 fathoms below the sea level. Four days were devoted to the survey of this shoal, whilst observations were being made on the neighbouring land. (Data contained in Tables III and IV.) This survey was necessarily carried out on board the ship with the relative instruments.

The results were the mapping of an area of magnetical disturbance  $3\frac{1}{2}$  miles long by  $1\frac{3}{4}$  miles average width, extending in a north-easterly direction. The positions of the greatest easterly disturbance and westerly disturbance having been found in proximity to one another, the ship was moored in the neighbourhood, and observations of declination, inclination, and total force made. From these a sectional

plan of the magnetic rock causing the disturbance has been made, and, together with the complete set of observations, the following results have been deduced.

The cause of the disturbance is a ridge of rock permanently magnetized, repelling the north-seeking end of the needle. In the transverse section this ridge is steeper on the south-east side where the disturbances are at a maximum than on the north-west side. Longitudinally the ridge rises rather abruptly to a principal peak (as determined by the point of maximum disturbance of the vertical force), followed by a depression, and a second peak, finally falling abruptly to the level.

The principal values of the disturbances caused by this ridge are—

Declination.....	56° E. on S.E. side, 26° W. on N.W. side.
Inclination .....	—29°.
Horizontal force..	—1·92 on S.E. side; +1·04 on N.W. side.
Vertical force ...	—4·44 metric units.

A geological survey of the coast at the Red Cliff (see map), where the greatest disturbances of the magnetic elements were observed, was made, and specimens of rock and sand were obtained which have since been tested for susceptibility. The evidence from these does not give any direct information tending to show the exact nature of the rock causing the remarkable disturbances over the magnetic shoal, but the character of the disturbances caused by the visible and invisible land are of a similar character.

Five diagrams are appended showing the data from which the foregoing results have been deduced, with a map showing the position of the “magnetic shoal” relative to the neighbouring land. Also a geological map of the Red Cliff and neighbourhood.

## II. “A Dynamical Theory of the Electric and Luminiferous Medium. Part II; Theory of Electrons.” By JOSEPH LARMOR, F.R.S., Fellow of St. John’s College, Cambridge. Received May 16, 1895.

(Abstract.)

In a previous paper on this subject,\* it has been shown that by means of a rotationally elastic æther, which otherwise behaves as a perfect fluid, a concrete realization of MacCullagh’s optical theory can be obtained, and that the same medium affords a complete representation of electromotive phenomena in the theory of electricity. The ponderomotive electric forcives were, on the other hand, deduced

\* ‘Roy. Soc. Proc.’ November, 1893; ‘Phil. Trans.,’ 1894, A, pp. 719—822.